



ENVIS NEWSLETTER

ON ENVIRONMENTAL BIOTECHNOLOGY
SPONSERED BY MINISTRY OF ENVIRONMENT AND FORESTS
GOVERNMENT OF INDIA



VOLUME-14

ISSN : 0974 2476

JUNE, 2009

BIOTECH INDUSTRY



**ENVIS CENTRE ON ENVIRONMENTAL BIOTECHNOLOGY
DEPARTMENT OF ENVIRONMENTAL SCIENCE
UNIVERSITY OF KALYANI
NADIA, WEST BENGAL**

Email: scsantra@yahoo.com, desku@envis.nic.in
Phone:033-25808749, Telefax :91-33-2580 8749
Websites : [http:// www.kuenvbiotech.org](http://www.kuenvbiotech.org)



ISSN-0974-2476

VOLUME-14 June, 2009

EDITOR

PROF.S.C.SANTRA
(ENVIS CO-ORDINATOR)

ENVIS STAFF

Ms. Nandini Gupta
(Programme Officer)
Ms. Amrita Saha Deb Chaudhury
(Information Officer)
Mr. Sourav Bandyopadhyay,
(Data Entry Operator)

PUBLISHED BY

ENVIS Centre on
Environmental Biotechnology
Department of Environmental Science
University of Kalyani, Kalyani
Nadia

SUPPORTED BY

Ministry of Environment and Forest
Government of India
New Delhi

**INSTRUCTIONS TO
CONTRIBUTORS**

ENVIS Newsletter on Environmental Biotechnology is a half-yearly publication publishes articles related to the thematic area of the ENVIS Centre. Popular or easily intelligible expositions of new or recent developments are welcome.

Manuscripts should be typewritten (font should be Times New Roman and font size ought to be 12) on one side of the paper in double spacing with maximum of 6-8 typed pages.

Figures and typed table should be in separate pages and provided with title and serial numbers. The exact position for the placement of the figures and tables should be marked in the manuscript.

Articles should be sent to:

The Coordinator
ENVIS Centre
Department of Environmental Science
University of Kalyani
Kalyani-741235
Dist- Nadia, West Bengal
Email: scsantra@yahoo.com
desku@envis.nic.in

CONTENTS

- **Biotech Industry:An Emerging Sector**
- **India's Emerging Biotechnology Industry**
- **Segmentation of the Indian Biotech Industry**
- **The Industry Structure**
- **Investment Opportunities in India in Biotech Industry.**
- **Economics of Biotech Industry.**
- **Market Research report Highlights.**
- **International Scenario of Biotech Industry.**
- **Welcome to Newsroom**
- **Forthcoming Events**
- **Query Form**

ACKNOWLEDGEMENT

Our ENVIS members are greatly thankful to Dr. Alok Chandra Samal, Ex- Programme Officer, ENVIS centre on Environmental Biotechnology, Department of Environmental Science, University of Kalyani.



FROM EDITOR'S DESK



Prof. S.C.Santra
ENVIS Coordinator

The biotechnology sector is one of the fastest growing knowledge-based sectors and is expected to play a key role in shaping rapidly developing economy. Indian biotechnology industry is increasing in its size on a global biotech industry map. India is emerging as a biotechnology hub in recent times and is demonstrating to be a perfect location for manufacturing as well as high-level biotech research programmes. Thus, in Volume-14, we have emphasized on the national and international scenario of the emerging Biotech Industry. Further we appreciate the views of the reader/user groups about this newsletter, so that we can enrich it further. We also invite relevant articles, news, events on this topic for publication in newsletter in future.

A handwritten signature in black ink, appearing to be 'S. C. Santra'.

(S. C. Santra)



BIOTECH INDUSTRY - AN EMERGING SECTOR

The biotech sector in India is among the fast growing knowledge based sectors, with India emerging as a biotechnology hub in the recent times. The Indian biotech sector stands 4th in terms of volume and 13th in terms of value. This sector is expected to play a key role in the new economy. India has many comparative advantages in terms of knowledge, skills, R&D facilities and costs in the sector. The institutional infrastructure in the country provides the basic foundation for these strengths to translate into business opportunities.

Advantage India

India has a promising potential to be a global player in the arena of Biotechnology Industry owing to a large pool of skilled and cost competitive manpower, well developed and integrated scientific infrastructure, advanced chemical synthesis technologies, manufacturing practices conforming to US and EU norms, diverse biological resources and, being globally recognized as a producer of low cost, high quality bulk drugs and formulations.

INDIA'S EMERGING BIOTECHNOLOGY INDUSTRY

"IT stands for India tomorrow & BT stands for Bharat Tomorrow." – Atal Behari Vajpayee, Prime Minister of India.

After leading the I.T bandwagon India has shifted its efforts to biotechnology. The alignment of a vast pool of scientific talent, a world class information-technology industry, and a vibrant generic pharmaceutical sector position India to emerge as a significant spot on the global biotech map. The Indian Biotechnology Industry has come a long way from its birth in

1996. It has crossed the \$1 billion mark in 2005-06. With a growth rate of 37% percent, the industry is now \$1.45 billion; 51.5 percent of the industry revenues account for exports (\$0.75bn). While it holds a strong position in the Asia Pacific region.

The world has woken up to the fact that India is a country that cannot be ignored while plotting the landscape of the Biotechnology industry of the future.

The industry has close to 200 biotechnology companies. These are a mixture of Indian & multinational companies, their subsidiaries and Joint Ventures.

Even though in the global biotech market, Indian share is presently just about 2% , the future seems very bright for the country. Biotechnology is a fast emerging sector in India. The consumption of biotech products in India is expected to grow up to the tune of \$ 4270 mn by the end of year 2010 .

Figure 1 lists the top 10 biotech companies in India

Figure 1: Top 10 biotech companies in India

Companies	Revenues (\$ billion)
Serum Institute of India	158.97
Biocon	155.56
Panacea Biotech	99.0
Mahyco Monsanto Biotech	88.46
Rasi Seeds	69.97
Venkateshwara Hatcheries	63.30
Novo Nordisk	39.56
Mahyco	26.45
Aventis Pharma	25.88
Indian Immunologicals	23.21

(Source: Biospectrum)

The top 10 companies mentioned above accounts for over 50 percent of the revenue generated. It is also to be noted that the top positions are almost equally distributed between domestic and foreign players.

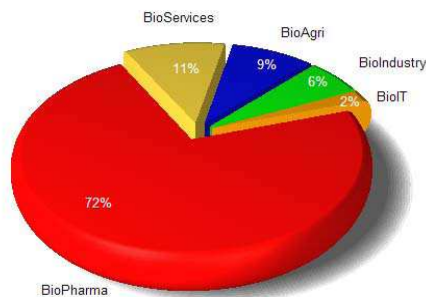
SEGMENTATION OF THE INDIAN BIOTECH INDUSTRY

The Indian Biotechnology market can be divided into the following segments:

- Biopharmaceuticals
- BioServices
- BioAgriculture
- BioIndustrial
- BioInformatics

Chart 1 gives the segment wise break up of the revenues of Indian biotechnology market.

Chart 1: Indian Biotechnology Industry: Segment wise Breakup



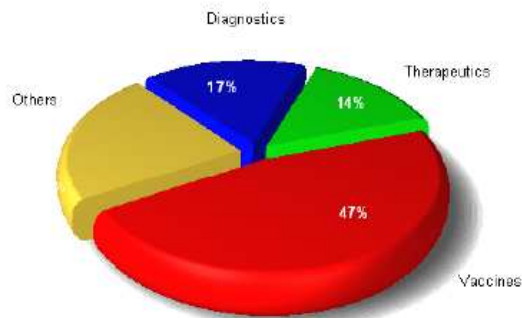
Source: Biospectrum

Biopharmaceuticals

This constitutes the largest segment of the industry both in terms of domestic and export revenues. It has crossed the 1 billion mark and is standing at \$1.044 billion. Vaccines, therapeutics and diagnostics fall into this category.

Chart 2 shows the percentage break up of the Indian Biopharmaceutical market

Chart 2: Percentage wise break up of the Indian Biopharmaceuticals market.



Source: Frost & Sullivan

BioServices

The Bioservices market is the second largest sector of the Indian Biotechnology Industry. The market’s growth can be attributed to the fact that India has become a popular destination for clinical trial, contract research and manufacturing activities. Therefore, it is no surprise that BioServices accounted for over 20 percent of the total biotechnology exports after BioPharma (74 percent of the biotechnology exports) in 2005-06. Another statistical data to note is that only 5 percent of the BioServices revenue came from the domestic market.

Several leading pharmaceutical companies are expanding their operations to include this aspect of the value chain as part of their offerings. Major players in this segment are Syngene, with Quintiles coming in at a close second. Vimta Labs, Lotus Labs and Lambda Therapeutic Research Limited are next in line.

Agricultural Biotechnology

This segment recorded the highest growth in the previous year at a whopping 81 percent. It can be segmented into:

- Hybrid seeds and transgenic crops
- Biopesticides
- Biofertilizer

Genetically modified cotton or commonly known as Bt cotton constitutes approximately 77 percent of the revenue of this sector; 94 percent of this sector's revenues come through the domestic route. Therefore, the export market of this segment is very small:

Biopesticides and biofertilizers together account only for 23 percent of the revenues garnered by agricultural biotechnology. India is an agrarian economy; therefore, both these markets have great potential.

The leading companies in this segment are Mahyco Monsanto, Rasi seeds, Ankur Seeds and Nuziveedu Seeds.

BioInformatics / BioIT

This is probably the smallest part of the current domestic biotechnology industry. With a market size of \$0.029 billion and a growth rate of 20 percent this sector is still in its infancy. However it is not a market to be underestimated; India is known for its strong IT base and it is due to this that India is sure to become a leading destination for work in the bioinformatics arena. There are around 35 companies in this space who are into core bioinformatics development, both in terms of developing the market and product while others are solely into marketing. Major players in this segment are Strand Genomics, Accelrys, GVK Biosciences, Molecular Connections, Tata Consultancy Services (TCS) and Ocimum Biosolutions.

BioIndustrial

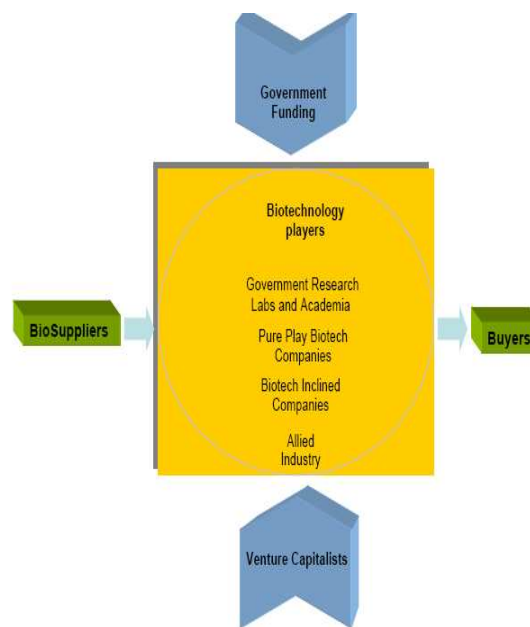
Generating 6 percent of the revenues of the biotechnology industry, it brought in \$0.08 billion in 2005-06. Although it accounts for a higher market share than Bioinformatics, with a growth rate of 17 percent it was found to record the slowest growth compared to its counterparts. This industry predominantly consists of enzyme

manufacturing and marketing companies. These enzymes are used in industries such as detergents, textiles, food, leather, paper and pharmaceuticals. In 2006, 89 percent of its revenue came from the domestic market and it constituted around 1 percent of the total biotechnology exports.

Biocon, Novozyme, Advanced Biochemicals, Rossari Biotech and Maps India are the top companies of this segment with close to 45 percent of the enzymes going to the pharmaceutical industry.

THE INDUSTRY STRUCTURE

Chart 3: Industry structure of the Indian biotechnology industry



Source: Frost & Sullivan

Biotechnology players: The Indian Biotechnology industry apart from being divided into segments is further divided into different strata as well. Research labs and institutions affiliated and approved by the Government form one stratum. Companies who are solely into biotech products on a commercial basis form the second stratum, pharmaceutical and IT

companies who have one division dedicated to biotechnology related activities are next. Allied industry comprises companies that offer services and support to the biotechnology industry.

BioSuppliers: With the biotechnology industry growing at a fast pace, its suppliers are also growing equally fast. Major suppliers include American, European and Indian companies with products as simple as test tubes and other consumables to high-end equipment. The market is currently dominated by MNCs that want to take advantage of the increased R&D investments by domestic biotechnology and pharmaceutical companies.

Buyers: Current buyers are of two types. The Government, private hospitals and ultimately the patient who uses the products for treatment and diagnostic purposes constitute the first. The second sets of buyers are other industries such as pharmaceutical companies and research institutions that use biotechnology intermediates and products in the process of creating their own end product.

Government Funding: The Government has invested billions of dollars in the biotechnology industry since 1985 and even presently is responsible for most of the funding in this sector. It does this through various Government agencies and research institutions that fund and carry out biotechnology research work. It has consistently increased its budgetary allocation over the years and has allocated \$550 million from 2002-2007. While most of this funding is for advanced research, there are organizations like the Technology Development Board (TDB) that give out equity and soft loans towards technology development solely for commercial purposes. The TDB is not exclusive to the healthcare or biotechnology industry but has so far invested the largest share of its funds in the same.

Private Funding / Venture Capital: The private sector is quite risk averse to investing in biotechnology projects in their gestation and early phases. However, a limited number of venture capitalists are investing in the same. They are:

- ICICI: incubator fund for funding start-ups; targeted fund size is \$25 million.
- Small Industries Development Bank of India (SIDBI), \$20 million Biotechnology Development Fund
- Andhra Pradesh Industrial Development Corporation (APIDC) Venture Capital Limited, funds could exceed \$12.3 million.
- Karnataka State Industrial Investment and Development Corporation: initial seed capital of \$2 million.

Future Scenario: Technology Trends

Stem Cell Research

Stem cells are the latest buzzword the world over. They are supposed to have the potential to repair organs, cure debilitating diseases such as Parkinson's, Alzheimer's and Diabetes and help in screening of drugs at an early stage thereby reducing the time to market. India also, is very keen to be a part of this budding area and is in the process of creating policies that promote research herein. It is drawing up plans to create a national initiative and build ties between hospitals and research scientists to optimize the funding provided for research in the same. The fund and the initiative's main aim is to create 'stem cell city clusters'. Several major institutes are involved in stem cell research; these include L.V Prasad, Christian Medical College in Vellore, Center for Cellular and Molecular Biology (CCMB) and the All India Institute of Medical Sciences (AIIMS). While it is predominantly institutes who are involved in research a few companies have also begun to take interest; some of them have even tied up with the former for the same. Some companies that have ventured into this

arena are LifeCell, Reliance Life Sciences, Biological E, Nicholas Piramal and Dr. Reddy's Laboratories. CCMB and Biological E in conjunction are working on the use of Cord blood cells to venture into newer areas; Life Cell in conjunction with the Sri Ramachandra Medical College opened India's first Cord blood bank in 2006. Although India is ranked third in terms of stem cell research in the world and places like the National Center for Biological Sciences and Reliance Life Sciences have been recognized by the United States Institutes of Health Research for cutting edge work in embryonic stem cell research, this sector is still in its early infancy. However it is expected to contribute revenues to the medical biotechnology and biopharmaceutical sectors of the Indian biotech industry by 2010.

Genomics

India being in the forefront of Genomics research seems to be an achievable target. The reasons for this are many. They are as follows:

- India's diversity in population: this unique and vast gene pool can be used for genomic and pharmacogenomic work. In addition, the country has a diverse disease profile and a large patient population.
- Large scientific and talent pool coupled with the relatively low cost of infrastructure and R&D.
- India's strong IT base and budding Bioinformatics industry would constitute the third reason for making such an ambition achievable.

The advantage of genomics is threefold in the sense that it not only gives us an insight into ourselves, it also reduces drug discovery cost and makes possible the dream of personalized and customized medication and treatment. The Institute of Genomics and Integrated Biology is already in the process of developing gene profiles of the Indian population.

Transgenic Crops

Research and development of this market is one of the Government's strategic priorities. This is because it has realized the potential of this market even if it only caters to the domestic demand. As mentioned in the AgriBiotech sector of Part 1, there are a number of universities conducting research on the same using Government funds. After Bt- Cotton the Government now seems to be concentrating on rice and is funding studies on genome sequencing of the same. Seed companies are also investing significantly in biotechnology, scaling up facilities, skills or creating partnerships with those who have skills in this arena.

However, what is to be noted is that the majority of the transgenic technologies and products are in the private domain. Therefore the Government needs to pay extra attention so that its good intentions of improving the agrarian economy do not prove counter productive. 7

Richness of Skilled Human Resource in Biotechnology Sector

It is estimated that 10% of researchers and 15% of scientists in Pharma/ Biotech R&D in USA are of Indian origin. India's rich human capital is believed to be the strongest asset for this knowledge-based industry having a large English speaking skill base,

- 3 million graduates,
- 700,000 postgraduates &
- 1500 PhDs qualified in biosciences and engineering.

Biotech industry in India at present is at the threshold of tremendous growth. For example, in the human and animal products segment of the industry alone, the vaccines market alone is valued at US\$ 230 million and is growing at 20 per cent. The success

of firms like Shanta Biotech and Bharat Biotech emphasise the fact. India's first genetically engineered vaccine, Shanta Biotech's Shanvac against Hepatitis B, costs \$4, less than half the price of similar vaccines marketed by multinational companies.

INVESTMENT OPPORTUNITIES IN INDIA IN BIOTECH INDUSTRY

The investment opportunities in India are very promising. Fresh investments of 145 mn hold the potential of creating a turnover of Rs. 200 mn. in the next 5 to 7 years, which could then further be utilized to innovate new products for the global biotech market.

Highlights of major milestones in Indian biotech Sector

India has achieved an amazing lot in a relatively short time. Some of the milestones for the Indian biotech are highlighted below.

Milestones ~ the first decade

- 1978 - Country's first biotech company BIOCON ~ for industrial enzymes
- 1981 - Center for Cellular & Molecular Biology (CCMB) ~ for DNA & r-DNA based research
- 1984- Institute for Microbial Technology, (IMTECH) ~ for R&D in microbial bio-processing
- 1986 -Department of Biotechnology (DBT), set up by Government of India of I ~ for promoting modern biology and biotechnology at academic and industry levels
- 1987 -National Institute of Immunology (NII) set up by DBT~ for immunology research
- 1989 -Bangalore Genei starts operations to produce restriction

enzymes & other tools for DNA based R&D

Milestones ~ the second decade

- 1991 -National Center for Biological sciences (NCBS) ~ to pursue R&D molecular biology
- 1994 -Syngene International, country's first CRC (promoted by Biocon) to offer R&D services in drug discovery based modern biology.
- 1997 -Center for Biochemical Technology (CBT) to focus on Bioinformatics and Genomics
- 1997-Shantha Biotech launches India's first recombinant product, Hep B vaccine
- 1998 -Monsanto research establishes an R&D center at IISc for plant genomics.
- 1998 -DBT approves Mahyco-Monsanto to conduct Bt cotton trials.

Milestones ~ the third decade

- 2000 -4 states Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu announce Biotech initiatives
- 2000 -Country's first Bionformatics company Strand Genomics formed by four IISc professors
- 2000 -GENOMED country's first JV between Institute (CBT) & Industry (Nicholas Piramal) to pursue pharmaco-genomics.
- 2001 -NCBS scientist sets up Avesthagen a plant genomics company.
- 2001 -GEAC approves Wockhardt's EPO.
- 2001 -NIH approves NCBS and Reliance Life Sciences as 2 out of 10 labs worldwide, for stem cell lines

- 2001 -Drug Authority implements GCP guidelines for clinical trials.
- 2001 -Millennium biotech policy, the first state level Biotech policy, announced by Government of Karnataka
- 2002 -Institute of Bioinformatics & Applied Biotechnology a jointly funded initiative between Government of Karnataka & ICICI commences academic program.
- 2002 -GEAC approves Bt cotton for commercial planting.
- 2002 -GEAC approves Shantha Biotech's Inteferon Alpha 2b.
- 2002 -Institute of Bioinformatics & Applied Biotechnology a jointly funded initiative between Government of Karnataka & ICICI commences academic program.
- 2002 -GEAC approves Bt cotton for commercial planting.
- 2002 -GEAC approves Shantha Biotech's Inteferon Alpha 2b.

India could make a good \$5 billion by 2010.

SWOT ANALYSIS OF INDIAN BIOTECH SECTOR

From this analysis, we can have a fare conception about the strengths & weakness as well as the opportunities & threats of the biotech industry.

ECONOMICS OF BIOTECH INDUSTRY

India being on the 'threshold of biotech revolution' has 280 biotech and 180 bio suppliers contributing to the total biotech market worth US \$100 billion. The country has a global market worth \$91 billion and there is scope for cheap R&D through bio-partnering and co-developing technologies mainly with Chinese and American companies. Already the world pharma companies are seeking India to set their research and development centers here. Moreover, to facilitate foreign investment, capital and government policies are being revised.

It has been found that Indian biotech firms are making a strong position, developing business models and improving product commercialization capabilities. With this,

<p>Strengths</p> <ul style="list-style-type: none"> • Trained manpower and knowledge base • Good network of research laboratories • Rich Biodiversity • Well developed base industries (e.g.: pharmaceuticals, seeds) • Access to intellectual resources of NRIs in this area. • Extensive clinical trials and research ~ access to vast & diverse disease populations • Bio-diversity ~ India's human gene pools offer an exciting opportunity for genomic 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Missing link between research and commercialisation. • Lack of venture capital • Relatively low R&D expenditure by industry • Image of Indian industry -doubts about ability of Indian products to meet international standards of quality
<p>Opportunities</p> <ul style="list-style-type: none"> • Large market • Export potential • Base for contract research for international companies due to rising costs of R&D abroad. • Large number of patients covering wider range of diseases 	<p>Threats</p> <ul style="list-style-type: none"> • Danger of anti-biotech propaganda gaining ground • IPR policies

MARKET RESEARCH REPORT HIGHLIGHTS

- Assessment of what is happening in China across the value chain, the organizational structure and, the interaction between Indo-China biotech businesses and research.
- Changes in patent policies and Intellectual Property Rights – A strategic analysis.
- Sales and demand analysis for biotech products in agri-business and clinical studies, 2005-2010.
- An estimate of the recent and future investment programs in Indian biotechnology sector and growth statistics.
- SWOT analysis of Indian biotechnology sector.
- New drafts and policies formulated by National Biotechnology Development Authorities and how it facilitates in private-public partnerships across biotech firms.
- Key profiles and marketing strategies.

INTERNATIONAL SCENARIO OF BIOTECH INDUSTRY

China's biotech industry: An Asian dragon is growing

Backed by a government intent on promoting innovation and fuelled by the “brain gain” of talented scientists and entrepreneurs returning from abroad, China’s health biotech industry only needs a more favourable investment climate to emerge as a global force in the production of therapies and medicines – both new and low-cost generics – experts say in a new study.

“The Chinese biotechnology industry is like a baby dragon, which will grow

quickly and soon become hard to ignore. It’s no longer the case that the industrialized world has hegemony over biotechnology innovation,” says co-author Peter A. Singer, MD, of the McLaughlin-Rotman Centre for Global Health (University Health Network and University of Toronto).

“However, for all its blossoming as an industrial and economic superpower, China still has one foot in the closed society of the past. For the sake of both national and global health, we hope China will embrace the financial and regulatory reforms needed to attract the venture capital required for sustained innovation in the health biotech sector,” he adds.

Looking abroad to boost region's biotech initiative

Pittsburgh development and biotechnology officials are banking on burgeoning ties with their counterparts in Asia and Europe to help boost the region's international biotech prospects.

The relationship-building initiative is part of an overall effort by several local economic development and industry groups, including the Pittsburgh Regional Alliance, Pittsburgh Life Sciences Greenhouse and **Pittsburgh Tissue Engineering Initiative**, to establish the region as a global biotech leader.

While the effort starts at home, it extends overseas, as well.

Regional efforts to stimulate international biotech relationships have not been limited to Asia.

The PRA has been working in recent months on cultivating ties with the French

Technology to Business Initiative. The PRA hosted the professional organization's managing director, Francois Large, earlier this month to talk about possible alliances with biotech firms in the Rhone-Alps region of France, according to Carlos Kearns, vice president of global investment for the PRA.

Competitive Positioning Strategies for Japanese Biotech Companies

Recent Initiatives from the Government Catalyze Market Growth. Significant government support is ensuring that Japan is fast emerging as a force to reckon with in the global biotechnology industry. Realizing its huge potential, the Japanese Government is pumping in funds, introducing administrative changes, and streamlining regulatory structures. These initiatives are helping shape biotechnology into a pillar industry of the Japanese economy and creating lucrative opportunities for companies planning to enter the market. For instance, having recognized the importance of industry-academia interaction, the government has modified regulations to create a viable environment in which such interactions can occur. Another key step taken by the government is the setting up of the Biotechnology Strategy Council, which is slated to play a defining role in boosting competition, strengthening R&D, and expediting technological advancement.

This research identifies and discusses drivers, restraints, and the latest trends and developments in the Japanese biotech market. Detailed analyses provide a clear understanding of Japan's standing in this market in relation to other countries, while competitive positioning strategies help

companies take advantage of available opportunities.

Strong Domestic Market - A Major Attraction for Biotech Companies

Biotech has thrown open the doors of the lucrative pharma industry, which has been hitherto impenetrable, to a host of small players. These companies will now have access to the second largest pharmaceutical market in the world, says the analyst. Japan's substantial domestic market for prescription products will benefit local companies that lack the financial resources to take their products out of the country. With high per capita spending on medicines, selling in the domestic market - even with low levels of investment - can be a profitable venture for these companies.

For foreign companies, the sheer size of the Japanese market is a considerable attraction. This gives Japan a distinct advantage over other countries in the region such as Australia, South Korea, and Singapore, whose biotech industries are limited by their smaller domestic markets.



Launching BioPartnering @ Bangalore Bio 2009

BioPartnering @ Bangalore Bio 2009 will offer a powerful internet platform for delegates to maximize partnering

opportunities with the Global biotech community before, during, and after Bangalore Bio 2009.

By attending Bangalore Bio and using biopartnering.com, you will have the opportunity to connect with the global biotechnology community. Instead of spending weeks or months traveling the world to connect with the deal makers, you will be able to arrange many meetings over a span of three days in one location!

Your networking community will grow as new companies register and upload a profile. You will not have to go far to reach them, just login to your account from anywhere at anytime.

(BioPartnering @ Bangalore Bio 2009)

India's Biotechnology Industry Blooming

Biotechnology industry in India is progressing.

India's significance in Biotechnology field is diverse. Besides generating skilled manpower plus a knowledge base, the country is demonstrating to be a perfect location for manufacturing as well as high-level biotech research programmes. With the help of government initiatives, Indian Biotechnology industry is perched for a remarkable growth.

The biotechnology market in India possesses a growth rate of 36.5% annually. This growth rate is among the maximum in the globe. Even though the country currently holds a market share of barely 2% of worldwide revenues however, it has an immense potential to develop into a major player in the worldwide biotechnology market by the year 2010.

Global biotechnology players have demonstrated an increasing interest in collaborating with Indian companies. This was highlighted by the fact that chief executive officers of several global companies participated at the biotechnology event in Bangalore.

Industry observers are comparing biotech industry in India to a baby elephant. It's still in its youth and possesses the potential to develop and acquire substantial space in the worldwide biotech business.

As per RNCOS' recent report "[Asia Pacific Biotechnology Market \(2007-2010\)](http://www.rncos.com/Report/IM520.htm)", Indian biotechnology market vis-à-vis the Asian and global markets, promises a great potential to become one of the most significant players in the global arena by 2010..

(<http://www.rncos.com/Report/IM520.htm>)

Business at BRI

The Biotechnology Research Institute (BRI) promotes, assists and conducts leading-edge research closely linked to the needs of the industry in three main areas:

- Health: for the development of cancer and infectious disease diagnostic and therapies
- Bioprocess: for bio-product manufacturing development
- Environment: for environmental protection and eco-efficient production

Partners of the BRI gain access to unique expertise and extensive research infrastructures. Through innovative and cost-effective research, the Institute helps its Canadian and international partners reinforce their development efforts and achieve their long-term goals.

The range of services offered to industrial partners includes:

- Fee-for-service
- Collaboration and partnership
- Technology licensing
- Industrial Partnership Facility

Finally, please contact the BRI Industrial Affair office to discuss specific project requirements or solutions the BRI might provide to face the great technological challenges of the biotechnology industry.

(balakrishnannair@expressindia.com)

Biotech industry body gets new chief

Dr M. Vidyasagar, Executive Vice-President, Tata Consultancy Services, is the new President of ABLE (Association for Biotechnology-led Enterprises), the biotechnology industry association. He along with the new office-bearers will hold office for the next three years until 2012, a release from the Association for Biotechnology-led Enterprises said here. This is ABLE's third executive council since it was set up in 2003. Mr Mani Iyer, Executive Director of Intas Biopharmaceuticals Ltd, is Vice-President; Ms Anuradha Acharya, Managing Director of Ocimum Biosolutions Ltd, is Treasurer; and Dr P.M. Murali, Managing Director of Evolva Biotech Pvt Ltd, is General Secretary. The executive council includes Ms Kiran Mazumdar Shaw, Chairman and Managing Director of Biocon Ltd; Dr Rashmi Barbhuiya, MD of Advinus Therapeutics Pvt Ltd; Dr Vijay Chandru, Chairman & Chief Executive Officer of Strand Life Sciences Pvt Ltd; Mr Nitin Deshmukh, CEO of Private Equity, Kotak Mahindra Bank; Prof Subba Rao, President (R&D) of BigTec Pvt Ltd; Dr K.K. Narayanan, Managing Director of Metahelix Life Sciences; Mr Pramod Chaudhari, CMD of

Praj Industries; and Mr Sarath Naru, MD of VenturEast Fund Advisors India P Ltd.

(Business Daily from THE HINDU group of publications. Sunday, Apr 12, 2009)

Green Product Trends: More Launches, More Sales



OAKLAND, Calif. -- Research ranging from product launches to retail sales shows that green products are staying strong, with long-time green companies like Seventh Generation seeing strong sales and mainstream companies launching more green lines. Companies have launched 458 products that claim to be "sustainable," "environmentally friendly" or "eco friendly," according to Datamonitor's Product Launch Analytics. If that trend continues there'll be 1,570 new green products launched this year, triple the amount launched in 2008. Following Clorox's launch of its Green Works cleaning line in early 2008, many other major brands like SC Johnson and Arm & Hammer have put out greener versions of their products, changing their product formulation, packaging, or both. Wal-Mart, too, has been a big player in greening up mainstream products through efforts like critiquing its suppliers' packaging and offering only concentrated laundry detergent. The company is releasing a 100 percent recycled content private label toilet paper, while Kimberly-Clark brand Scott puts out a range of recycled content paper products. (By GreenerDesign Staff, GreenerDesign Published April 24, 2009).

**SOME RECENT
PUBLICATIONS RELATED
TO ENVIRONMENTAL
BIOTECHNOLOGY**

Bioaccumulation

1. Valeska Contardo-Jara, Eva Klingelmann and Claudia Wiegand. Bioaccumulation of glyphosate and its formulation Roundup Ultra in *Lumbriculus variegatus* and its effects on biotransformation and antioxidant enzymes. Environmental Pollution, Volume 157(1) (2009): 57-63
2. E. Lehdorff and L. Schwark. Biomonitoring airborne parent and alkylated three-ring PAHs in the Greater Cologne Conurbation II: Regional distribution patterns. Environmental Pollution, Volume 157(5) (2009): 1706-1713

Bioremediation

3. Gulay Bayramoglu, Ihsan Gursel, Yagmur Tunali and M. Yakup Arica. Biosorption of phenol and 2-chlorophenol by *Funalia trogii* pellets. Bioresource Technology, Volume 100(10) (2009): 2685-2691
4. Yi Cheng, Zhaohui Guo, Xueduan Liu, Huaqun Yin, Guanzhou Qiu, Fengkai Pan and Hongwei Liu. The bioleaching feasibility for Pb/Zn smelting slag and community characteristics of indigenous moderate-thermophilic bacteria. Bioresource Technology, Volume 100 (10) (2009): 2737-2740

Biotransformation

5. Lei Cai, Mei-Qing Yuan, Feng Liu, Jia Jian and Guo-Qiang Chen. Enhanced production of medium-chain-length polyhydroxyalkanoates (PHA) by PHA depolymerase knockout mutant of *Pseudomonas putida* KT2442. Bioresource Technology, Volume 100(7) (2009): 2265-2270
6. Yan Li, Yuan-Yuan Li, Zhi-Yuan Mi, Dong-Sheng Li and Ya-Jie Tang. Novel biotransformation process of podophyllotoxin to produce podophyllin

acid and podophyllotoxin by *Pseudomonas aeruginosa* CCTCC AB93066, Part II: Process optimization. Bioresource Technology, Volume 100(7) (2009): 2271-2277

Biomarker

7. M. Ashraf. Biotechnological approach of improving plant salt tolerance using antioxidants as markers. Biotechnology Advances, Volume 27(1) (2009): 84-93

Bioengineering

8. Xueming Tang Yongsong Tan, Hong Zhu, Kai Zhao, and Wei Shen Microbial Conversion of Glycerol to 1,3-Propanediol by an Engineered Strain of *Escherichia coli*. Applied and Environmental Microbiology, Volume 75 (6) (2009): 1628-1634

Biofertilizer

9. Muhammad Yasir, Zubair Aslam, Seon Won Kim, Seon-Woo Lee, Che Ok Jeon and Young Ryun Chung. Bacterial community composition and chitinase gene diversity of vermicompost with antifungal activity. Bioresource Technology, Volume 100(19) (2009): 4396-4403

Biocomposting

10. D.K. Sharma, A.K. Pandey and Lata. Use of *Jatropha curcas* hull biomass for bioactive compost production. Biomass and Bioenergy, Volume 33(1) (2009): 159-162

Biodegradation

11. Awadhesh K. Shukla, Pranjali Vishwakarma, S.N. Upadhyay, Anil K Tripathi, H.C. Prasana and Suresh K. Dubey. Biodegradation of trichloroethylene (TCE) by methanotrophic community. Bioresource Technology, Volume 100(9) (2009): 2469-2474
12. Basanta Kumar Biswal, Satyendra Nath Tiwari and Suparna Mukherji. Biodegradation of oil in oily sludges from steel mills. Bioresource Technology, Volume 100(4) (2009): 1700-1703

Forthcoming Events

Events	Date	Place
World Congress on Industrial Biotechnology & Bioprocessing	July 19-22, 2009	Montreal, Quebec, Canada
BioEquity Europe	June 9-10, 2009	Munich, Germany
EU-JAPAN industrial and environmental biotechnology summit	September. 3-9, 2009	Yokohama, Japan (http://ica.cordis.lu)
7 th International Conference on the Environment and sustainable Development	July 6,2009	Havana, Cuba
Biotechnica	October6-8, 2009	Hnnover.

Query Form

Name:
 Designation:
 Communicating Address:
 E-mail:
 Area of specialization:
 Views on our Newsletter:
 Suggestion for improvement:
 I would to collect information on Environmental Biotechnology on the following:
 Subject: _____ Keywords: _____
 Others: _____

Signature _____

FROM: ENVIS CENTRE DEPARTMENT OF ENVIRONEMNTAL SCIENCE UNIVERSITY OF KALYANI, KALYANI NADIA , PIN-741235 WESTBENGAL	To, _____ <div style="text-align: right; font-weight: bold;">BOOK POST</div> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/>
---	--